AL'TSHULER, L. M.

"Analytical Determination of a Tube Temperature in a Half-Intinite Massive."

Report submitted for the Conference on Heat and Mass Transfer, Minsk, BSSR, June 1961.

AL'TSHULER, L.M.

Temperature field of a cylindrical source in a half-limited block [with summary in English]. Inzh.-fiz. zhur. 4 no.3: 64-71 Mr '61. (MIRA 14:8)

1. Sel'skokhozyaystvennyy institut, g. Leningrad.
(Thermodynamics)

GOL'DBERG, N.A.; AL'TSHULER, L.N.; Prinimali uchastiye: MOLOCHNYY, V.B.; ZHARIKOVA, V.I.

Macroscopic kinetics and the mechanism of urea synthesis from ammonia and carbon dioxide. Khim.prom. no.9:638-642 S '62. (MIRA 15:11)

(Urea) (Ammonia) (Carbon dioxide)

GOL'DBERG, N.A.; AL'TSHULER, L.N.

Macroscopic kinetics and mechanism of the synthesis of urea from ammonia and carbon dioxide. Khim.prom. no.1:54-57 Ja '64. (MIRA 17:2)

ALTSHULER, L.V.

A-1

Simple method of preparing X-ray photomicrographs of polished surfaces, using a camera obscura. L. V. ALTSCHULER and V. A. TSUKERMAN (Zavod. Lab., 1938, 7, 1279—1283).—Apparatus is described. R. T.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

Br. Ab.

AL'TSHULER, L. V.

apparatus etc.

Apparatus for rapid X-ray structure tests and X-ray motion pictures. L. V. Altschuler and V. A. Zukerman (*Zavod. Lab.*, 1939, 8, 449—458).

J. J. H.

AL'TSHULER, L.V.

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27

Structural Changes in the Surface Layers of Quenched Steel under the Influence of Grinding. L. V. Al'tshuler and M. P. Speranskaya. (Vestnik Metallopromyshlennosti, 1940, No. 1, pp. 15–21). (In Russian). Earlier studies of the surface finish, structure and wear-resistance of the ground steel surfaces which are so important in the manufacture of measuring instruments are briefly referred to. X-ray investigations by the authors on 1·5% chromium tool steel ground either after quenching or after quenching and artificial ageing at 150° C. for 3 hr., showed that in both cases grinding had at least the effect, judging by the structure produced, of a high-temperature tempering on the surface layers of the specimens. Coarse-grinding of quenched steel produced an austenitic structure on the outer surface layer, below which successive layers showed gradually diminishing temper effects, the layers merging into the original quenched steel with a tetragonal martensitic structure. The amount of austenite found increased with increasing quenching temperature of the steel being ground. The authors conclude that the grinding of unquenched steel does not lead to the formation of austenite. The above transformations cause stresses to be set up in a surface layer approximately 0·1 mm. thick. These stresses may lead to grinding cracks, and they also account for the previously observed reduced wear-resistance of the 0·1-mm. surface layer of ground-quenched steel. It is estimated that grinding causes localised heating to 1000° C. for 5×10^{-5} sec. This very rapid heating explains the above structural changes observed in the surface layers of ground quenched and unquenched steels.

A.S.M.-S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

ALTSHULER, L.V.

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Universal Apparatus for Rapid X-Ray Structure Analysis. L. V. Al't-shuller (*Zavod. Lab.*, 1940, 9, (8), 872-876).—[In Russian]. Descriptive.
—N. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS PROCESSES AND PROPERTIES INDEX

ALTSHULER, L.V.

3

Theory of the focusing of axial beams and the methods
of high-speed structural röntgenography. L. V. Altshuler
J. Exptl. Theoret. Phys. (U. S. S. R.) 13, 388-98(1943).
The necessary conditions for and possible methods of
solving the problem of rapid x-ray structural analyses are
discussed. The conditions of focusing are studied ana-
lytically. The current for min. fogging and a new spheri-
cal formula for the focused surface are obtained. On
the basis of the theory developed, a high-powered method
of photographing cylindrical samples is developed, with
a current of only 1-3 ma./sec. at 30-40 e.-kv. The
röntgenograms made require only 10^{-4} to $10^{-[illegible]}$ sec. ex-
posure. Details of the app. are given. P. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

AL'TSHULER, L.V.

CA

9

Plastic deformation and surface fatigue of hardened steel in antifriction bearings. L. V. Altshuler, N. A. Rozhetkina, A. O. Spektor and B. A. Tsukerman. *J. Tech. Phys.* (U. S. S. R.) 13, [illegible]-80(1943).—With the aid of a special axial camera, an x-ray analysis was made of chrome steel balls, 18 mm. in diam., initially hardened in oil at 830° and tempered for 3 hrs. at 150°; the structure was that of tetragonal martensite with traces of residual austenite; the surface hardness 60 to 64 Rockwell C. Alternating contact compressions in the working surface of the ball bring about plastic deformation of the martensite grains giving rise to two axially symmetrical orientations of the crystallites —[111] and [001], the axis being perpendicular to the surface of the ball and coinciding with the direction of the contact compressions. The surface hardness of the balls increased by 4 to 7 Rockwell units. The max. of hardness is located at the surface. It is concluded that the mechanism of plastic deformation in iron remains unchanged in hardened high-C steel.

N. Thon

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ALTSHULER, L.V.

Ca

9

Graphical classification of multiple-component alloys. L. V. Al'tshuler. *Bull. acad. sci. U.R.S.S., Classe sci. tech.* 1940, [illegible]-10.—A. discusses various methods of plotting systems contg. 4-7 components, with particular reference to high-alloy steels. H. W. Rathmann

Inst. Mech. Eng., AS USSR

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ALTSHULER, L.V.

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Altschuler, L. V. Sur l'explosion dans un milieu compressible plastique. C. R. (Doklady) Acad. Sci. URSS (N.S.) 52, 199-202 (1946).

The propagation of a spherical explosion wave in a plastic body is discussed under the following simplifying assumptions: the density ... is constant ... maximum shearing stress ... W. Prager

Source: Mathematical Reviews.

56-34-4-14/60

AUTHORS: Al'tshuler, L. V., Krupnikov, K. K., Ledenev, B. N., Zhuchikhin, V. I., Brazhnik, M. I.

TITLE: The Dynamic Compressibility and the Equation of State of Iron at High Pressures (Dinamicheskaya szhimayemost' i uravneniye sostoyaniya pri vysokikh davleniyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 874 - 885 (USSR)

ABSTRACT: This work discusses 2 methods for the description of the dynamic compressibility of materials, which are based upon the determination of the kinematic parameters - the propagation velocity and the mass velocity of the material behind the front. The measurement of wave velocities by means of donors being mounted in the path of the shock wave is relatively simple. In contrast to this the immediate observation of the mass velocity is impossible in most of the cases. The authors worked out 2 methods for the complex determination of the kinematic parameters of the wave, namely the "method of repelling" and the

Card 1/3

The Dynamic Compressibility and the Equation of State of Iron at High Pressures 56-34-4-14/60

"method of slowing down". In the method of repelling the propagation of a strong crack is investigated, which forms on the occasion of the reflection of a detonation wave at an elastic obstacle. The experimentally measurable quantities on this occasion are the wave velocity D and the velocity W of the displacement of the free surface of the obstacle on the initial part of the trajectory. W is approximately equal to the double mass velocity of the substance behind the wave front. The velocity of motion W is obtained by the material of the obstacle under the action of two different processes, namely of the shock-like transition from the state $P_0 = 0; v_0$ into the state $P_1; v_1$, and of the subsequent isentropic expansion in the oncoming relief wave. The second paragraph deals with the method of the investigation and with the experimental technique. The third paragraph reports on the dynamic adiabatic line of the iron. A table gives the parameters of all experimentally stated figurative points of the adiabatic curve of the shock in iron. Within the whole investigated domain of the mass velocities

Card 2/3

The Dynamic Compressibility and the Equation of State of Iron at High Pressures 56-34-4-14/60

from U = 1,0 to U = 5,17 km/sec the linear relationship D =3,80 + 1,58 U is valid for the propagation velocity D of the shock wave. In the next paragraph the compression of iron at the temperature zero is computed and in the last paragraph the curve of the compressibility of iron is extrapolated to the domain of relatively low degrees of compression. The developed method allows to fix the dynamic adiabatic curve of iron with different initial density within the interval of pressures of from $4 \cdot 10^5$ to $5 \cdot 10^6$ atmospheres. The dynamic adiabatic curve of porous iron with decreased initial density is in the diagram pressure - density considerably higher than the adiabatic of the compact material which speaks for the great influence of the thermic component in the shock-like compression. The authors derived an empirical equation of state of iron and ascertained the course of the curve of the cold compressibility unto the densities $\rho = 1,7\rho_0$. This work was carried out on the initiative by Ya.B.Zel'dovich. The authors also mention the cooperation of a number of other authors.

Card 3/3

56-34-4-15/60

AUTHORS: Al'tshuler, L. V., Krupnikov, K. K., Brazhnik, M. I.

TITLE: The Dynamic Compressibility of Metals Under Pressures of From 400 000 to 4 Million Atmospheres (Dinamicheskaya szhimayemost' metallov pri davleniyakh ot chetyrekhsot tysyach do chetyrekh millionov atmosfer)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 886 - 893 (USSR)

ABSTRACT: This paper reports on the bases of a method for the experimental determination of the dynamic compressibility of copper, zinc, cadmium, tin, silver, gold, lead, and bismuth at pressures of from 400 000 to 4 000 000 atmospheres. In the case of all these materials the knowledge of only one dynamic adiabatic curve is not sufficient for the determination of the equations of state, which establish a relation between the pressure and the temperature and density. Yet the data on the shock-like compressibility at pressures of hundred thousands and millions of atmospheres are very valuable for the verification of the theoretical

Card 1/3

The Dynamic Compressibility of Metals Under Pressures of From 400 000 to 4 Million Atmospheres

56-34-4-15/60

ideas on the behaviour of matter on such conditions. The authors investigate the transition of a shock wave with known amplitude from the medium A into the substance B. The experimental method is discussed in detail. A plane shock wave caused by an explosion passed an iron shield to which samples of iron and of the materials to be investigated were pressed. The 3 series of experiments differ in the pressure of the shock wave in the shield. The propagation velocities of the shock wave obtained in these experiments are composed in a table. There are also given the parameters of the shock waves in the iron shields and the initial densities ϱ_0 of the investigated samples. In all investigated metals, with the exception of tin, the dependence of the displacement velocity D of the wave front in the undisturbed medium on the velocity U of matter behind the wave front for $U > 1$ km/sec is sufficiently exactly approximated by linear relationships of the kind $D = C_0' + \lambda U$. The degree of compression in a certain way depends on the initial atom volume. In the case of increasing pressures the wave velocity and the mean modulus of the shock-

Card 2/3

The Dynamic Compressibility of Metals Under Pressures of From 400 000 to 4 Million Atmospheres

56-34-4-15/60

-like compression increase for many times. The authors thank A.N.Kolesnikova, S.N.Pokrovskiy, A.L.Zhiryakov, M.M.Pavlovskiy and V.P.Drakin for their cooperation in this work. There are 5 figures, 5 tables and 3 references, 2 of which are Soviet.

SUBMITTED: December 28, 1957

1. Metals--Mechanical properties

Card 3/3

SOV/20-121-1-17/55

AUTHORS: ~~Al'tshuler, L. V.,~~ Bakanova, A. A., Trunin, R. F.

TITLE: Phase Transformations When Water Is Compressed by Strong Shock Waves (Fazovyye prevrashcheniya pri szhatii vody sil'nymi udarnymi volnami)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 121, Nr 1, pp. 67-69 (USSR)

ABSTRACT: This paper gives a report on the shock-like compression of water in the range of pressures from 20 000 to 800 000 atmospheres. On this occasion the kinematic parameters of the shock wave, namely, its velocity of propagation D and mass velocity U of matter behind the wave front, were measured. Because of the laws of conservation of mass and momentum these parameters are connected with the density of the shock-like compression $\varrho = \varrho_0 D/(D-U)$ and with the pressure $P = \varrho_0 DU$; ϱ_0 denotes the density of matter before the compression. The method of investigation can be simplified very much when the shock wave is lead to the layer of the substance to be investigated through shields of a material with known

Card 1/2

SOV/20-121-1-17/55

Phase Transformation When Water Is Compressed by Strong Shock Waves

Hugoniot (Gyugonio) adiabatic line of the shock compression. The quantities measurable by experiment are the speed of the shock waves in the shield and in water. The dynamical adiabatic line of water consists of two sections which with their ends fix the region of phase transition. The existence of the phase transition is also proved by the decrease in transparency of water when a shock wave of sufficiently high amplitude of pressure $P > P_1$ goes through. In the case of shock waves with an amplitude of pressure $P < P_1$ the transparency does not change. There are 4 figures and 5 references, 1 of which is Soviet.

PRESENTED: January 17, 1958, by Yu. B. Kharitonov, Member, Academy of Sciences, USSR

SUBMITTED: November 26, 1957

1. Water--Pressure 2. Water--Properties 3. Phase transitions
4. Shock waves--Velocity 5. Shock waves--Physical effects

Card 2/2

82413

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B006/B014

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AUTHORS: Al'tshuler, L. V., Kormer, S. B., Bakanova, A. A., Trunin, R. F.

TITLE: Equation of State for Aluminum, Copper, and Lead in the High-pressure Range

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 3, pp. 790-798

TEXT: In the present paper, the authors discuss the conclusions applying to aluminum, copper, and lead, as result from an equation deviating from the Mie - Grueneisen solid-state equation. The equation considered by the authors deviates in that it holds within a wide pressure- and temperature range, and that the thermal electron components of energy and pressure are taken into account. Moreover, data are furnished concerning dynamic compression of aluminum up to pressures of 2.10^6 atm, and results of new measurements of the compressibility of copper, lead, and iron at 10^6, 2.10^6, and 4.10^6 atm are offered. Numerous theoretical and experimental details concerning the adiabatics of these three metals are discussed in the introduction, with special regard to the collision adiabatics (Ye. I. Zababakhin, Yu. F.

Card 1/3

82415

Equation of State for Aluminum, Copper, and Lead in the High-pressure Range

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Alekseyev). Ansatzes for the equation of state and internal energy have the form $P = P_{int} + P_{therm} + P_{exc}$ and $E = E_{int} + E_{therm} + E_{exc}$ (2). The first terms of these sums characterize the interaction of atoms at $0^{\circ}K$, the second terms are thermal ones determined by lattice vibrations, and the third terms are determined by the thermal excitations of electrons. In the following, the various terms are written down explicitly; and finally, the following explicit expressions are obtained for pressure and temperature:

$P = P_{int} + \frac{\gamma_p C_{vp}}{v}\left[T - T_o + E_o/C_{vp}\right] + \frac{1}{4}\varrho_o\beta_o\,(v_o/v)^{1/2}T^2$ and

$E = \int_{v}^{v_{ok}} P_{int}dv + E_o + C_{vp}(T-T_o) + \frac{1}{2}\beta_o(v/v_o)^{1/2}T^2$. According to equation (1) for the dynamic adiabatics $P_G = \sum a_k(\sigma - 1)^k$, dynamic experiments permitted a determination of pressure P_G and also of energy $E_G = E_o + \frac{1}{2}P_G(v_o - v)$.

Results of computations for aluminum are given in Table 5, for copper in Table 6, and for lead in Table 7. As is shown by Figs. 1 and 2, thermal

Card 2/3

92415

Equation of State for Aluminum, Copper, and Lead in the High-pressure Range

S/056/60/038/03/14/033
B006/B014

pressure plays an important part in the compression of metals by strong shock waves. For the pressures 216.10^{10} bars (Al), 388.10^{10} bars (Cu), and 401.10^{10} bars (Pb), the thermal pressure components amounted to 59.10^{10}, 115.10^{10}, and 124.10^{10} bars. For the same pressures, the thermal energy component was 57% (Al), 60% (Cu), and 69% (Pb). Finally, the authors thank A. I. Funtikov, R. V. Malyshev, and I. P. Dudoladov, as well as Professor K. A. Semendyayev for their assistance, advice, and discussions. L. D. Landau is also mentioned in this article. There are 2 figures, 7 tables, and 14 references, 4 of which are Soviet. LX

SUBMITTED: October 7, 1959

Card 3/3

83715

S/056/60/038/004/006/048
B019/B070

1.1210

24.4100

AUTHORS: Al'tshuler, L. V., Kormer, S. B., Brazhnik, M. I., Vladimirov, L. A., Speranskaya, M. P., Funtikov, A. I.

TITLE: The Isoentropic Compressibility of Aluminum, Copper, Lead, and Iron at High Pressures

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1061-1073

TEXT: New methods of investigation of the properties of materials at high pressures depend on the application of shock waves. Two parameters are determined: the velocity of propagation of the shock waves, and the particle velocity at the front, which enable the pressure and the density of the shock compression to be determined. Another important kinematic parameter is the velocity of sound in the shock compressed material. This quantity characterizes the velocity of propagation of small disturbances in the compressed material. These small disturbances are weak shock waves and discharge waves, and are of importance in geophysical and other similar investigations. In the present paper, a method is suggested for

Card 1/3

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83715

The Isoentropic Compressibility of Aluminum, Copper, Lead, and Iron at High Pressures

S/056/60/038/004/008/048
B019/B070

the measurement of the velocity of sound in the front of strong shock waves, and results of investigations for aluminum, lead, and iron for the pressures between $4\cdot10^5$ and $3.5\cdot10^6$ atm are given. In the first section a method of measuring the velocity of sound is given which depends on measurement with the discharge waves. In this method the decrease of pressure due to the superposition of the discharge and dilatation waves in the zone of the boundary of the sample in the form of a stepwise built cylinder is measured photochronographically. In the second section, elastic and plastic discharge waves are discussed. In the third part, a method of measurement is discussed in which the collision of a plate and a sample from a material of known dynamic adiabatics is studied. This method leads to an experimental determination of the trajectories of the shock waves, and to the measurement of the particle velocities at one or more points of these trajectories. In the fourth part, the data given in Tables 2, 3, 4, and 5 are discussed in detail. In the last two sections, the isoentropic compressibility of the metals, and the upper limit of "cold" compression are studied on the basis of the results obtained here; and an estimate of the thermal energy and the temperature is made. In the present paper, the existence of two sound velocities corresponding to the

Card 2/3

83715

The Isoentropic Compressibility of Aluminum, Copper, Lead, and Iron at High Pressures

S/056/60/038/004/008/048
B019/B070

elastic and plastic states of matter are established. The velocities of sound, and the isoentropic compressibilities in the above mentioned pressure range, the estimates of thermal energies; the temperature of shock compression; and the Grüneisen coefficients are given in tables. Yu. M. Shustov is mentioned. The paper was started in 1948 on the initiative of Academician Ya. B. Zel'dovich. The Corresponding Member of the AS USSR Ye. I. Zababakhin is thanked for many valuable advices. K. K. Krupnikov, B. N. Ledenov, and A. A. Bakanova are thanked for discussions. Professor V. A. Tsukerman and his colleagues I. Sh. Model' and M. A. Kanunov helped in the constructional problems. Some data were obtained from V.I.Borodulin. N.S. Tenigin, A. N. Kolesnikova, L. K. Gorelova, and K. S. Shvetsov helped in the experimental work. There are 10 figures, 7 tables, and 8 references: 5 Soviet and 3 US.

SUBMITTED: October 7, 1959 (initially), January 3, 1960 (after revision)

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Card 3/3

Al'tshuler, L.V.

S/056/60/039/01/02/029
B006/B070

AUTHORS: Al'tshuler, L. V., Kuleshova, L. V., Pavlovskiy, M. N.

TITLE: Dynamical Compressibility, Equation of State, and Electrical Conductivity of Sodium Chloride at High Pressures

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1 (7), pp. 16-24

TEXT: The authors report on the compressibility and conductivity of single crystals of rock-salt under pressures ranging from $50 \cdot 10^3$ to $800 \cdot 10^3$ atm. That many dielectrics show much higher conductivity during the passage of shock waves, was discovered by A. A. Brish, M. S. Tarasov, and V. A. Tsukerman in 1950. A similar effect in dynamically loaded ionic and molecular crystals was detected in 1956. The relationship between the dynamical and electrical properties, and the characteristic of shock waves has, however, not yet been investigated. To do so was the purpose of the present work. The dynamical compressibility of single crystals of rock-salt (2.16 g/cm^3) was measured by a method

Card 1/3

Dynamical Compressibility, Equation of State, and Electrical Conductivity of Sodium Chloride at High Pressures

S/056/60/039/01/02/029
B006/B070

described in Ref. 5. The parameters of the measured shock adiabatics are compiled in Table 1. Fig. 1 shows the DU-diagram of the shock adiabatics, D and U denoting the wave and mass velocities of the shock wave. The highest applied pressure increased the crystal density 1.85 times. Fig. 2 shows $P_g(\delta)$, and Fig. 3 $P(\delta)$; P_g denotes the pressure of shock compression, $\delta = v_{0K}/v$, v is the specific volume behind the shock wave in the initial state, and v_{0K} is the same at 0°K. In the following, the volume dependence of Grüneisen coefficients $\gamma(v)$ is investigated starting from an expression due to Slater and L. D. Landau, and also from one in Ref. 9. Two expressions (7a) and (7b) are obtained giving γ as a function of n and δ. n is a parameter taken from the theory of ionic crystals and lies between 7.84 and 9.1 (Refs. 10 and 11). The two γ-formulas are again transformed into (9a) and (9b) which give γ as functions of δ, the lattice parameter ρ, and the interatomic distance r. Analysis shows that, in the range of densities investigated, the repulsive force may be represented in the form $Be^{-r/\rho}$ with $\rho = 0.318$ A. In this range the

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Card 2/3

Card 3/3

AL'TSHULER, L.V.; KORMER, S.B.

Internal structure of the earth. Izv. AN SSSR. Ser. geofiz. no.1:33-37 Ja '61. (MIRA 14:1)
(Earth—Internal structure)

23728

S/057/61/031/006/012/019
B116/B203

11210 also 1418

AUTHORS: Al'tshuler, L. V. and Petrunin, A. P.

TITLE: X-ray study of the compressibility of light substances in slanting collision of shock waves

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 6, 1961, 717-725

TEXT: The present paper describes an X-ray method for studying regular slanting reflections and slanting collisions of shock waves in solids and liquids. The method serves for determining the pressures and densities in the region of stepwise "twofold" compression behind the front of reflected shock waves. The authors investigated light metals (magnesium, aluminum) and light-atom compounds diaphanous to X-rays (water, paraffin, plexiglass). They found, for all substances in the area of reflection, high densities and pressures of 600,000 - 900,000 kg/cm exceeding by a multiple the pressures of shock waves before collision. Reflections with relatively small angles of incidence of shock waves are studied. It is shown that the parameters of the incident waves and the angle formed by the front of the reflected shock wave with the reflection plane must be

Card 1/8

23728

known to determine the parameters in the region of twofold compression. For determining this angle, the authors used the pulse radiography illustrating the momentary position of shock waves within the X-rayed specimen. To illustrate the method, they first study the collision of waves of the same intensity (reflection of a wave from an absolutely rigid obstacle)(Fig. 2). In regular reflection, the space above the reflecting wall is divided into three regions: "0" is the region of rest, "1" is the region of a single shock-compression between the fronts of the incident and the reflected wave, "2" is the region of twofold shock-compression between the front of the reflected wave and the obstacle. Fig. 2 shows the position of the incident and of the reflected wave for two points of time. q are the velocities of the substance flow. The following equations are written down:

$$D_{12} = D_1 \frac{\sin\beta}{\sin\alpha} + U_1 \cos(\alpha + \beta), \quad (1)$$

$$\Delta U_{12} = U_1 \frac{\cos\alpha}{\cos\beta}, \quad (2)$$

$$\delta_2 = \sigma_1 \frac{D_{12}}{D_{12} - \Delta U_{12}}, \quad (3)$$

$$P_2 = P_1 + \rho_0\sigma_1 D_{12}\Delta U_{12}, \quad (4)$$

Card 2/5

X-ray study of the compressibility ... S/057/61/031/006/012/019
B116/B203

D_1 is the velocity of the incident shock wave, D_{12} that of the reflected wave, U_1 is the mass velocity behind the front of the incident wave, ΔU_{12} is the change of mass velocity at the front of the reflected wave. $\sigma_2 = \rho_2/\rho_0$; $\sigma_1 = \rho_1/\rho_0$; ρ_0, ρ_1, ρ_2 is the density of the substance at rest, in single, and in twofold shock-compression, respectively; P_1 is the pressure in "1", and P_2 in "2". It follows from (1) - (4) that the parameters of twofold compression are uniquely determined by the parameters of the incident wave, the angle of incidence α, and the reflection angle β. The parameters of the incident wave are found by usual dynamic methods, while α is given by the test conditions. β is determined from the X-ray pictures at the instant of collision of shock waves. Now, the authors study the regular reflection of shock waves from an elastic obstacle (Fig. 3) assuming that $P_2=P_3$ (pressure of the shock wave in the obstacle), and the flow behind the reflected wave moves in parallel to the obstacle. Instead of (2),

$$\Delta U_{12} = U_1\frac{\cos\alpha}{\cos\beta} - \frac{\sin\varepsilon}{\cos(\beta+\varepsilon)}\left[\frac{D_1}{\sin\alpha} - U_1\frac{\sin(\alpha+\beta)}{\cos\beta}\right]. \qquad (2a)$$

Card 3/8

27128

is written down for this case. The angle δ can be determined, like β, from the X-ray picture. Figs. 4 and 5 show the arrangement of experiments. δ_2 was found from L_o/L. L_o is the distance between the aluminum foils on the preparatory X-ray picture, and L is the distance between them on the explosion X-ray picture. To attain high intensities of shock waves, the authors used a synchronous collision of two aluminum foils (6 mm thick, 70 mm diameter), the foils reaching a velocity of W = 3.44 km/sec (Fig. 5). The parameters of the shock waves generated by the shock on the aluminum foils in the specimens were determined from the pressure-velocity diagram (intersection of the dynamic adiabatics for the substances investigated with that for aluminum). The dynamic adiabatics for magnesium and aluminum were taken from papers by J. M. Walsh, M.H. Rice, R.G. Mc Queen, F.L. Yarger (Ref. 2: Phys. Rev., 108, no. 2, 196-216, 1957) and L.V. Al'tshuler, S.B. Kormer, A.A. Bakanova, R.F. Trunin (Ref. 3: ZhETF, 38, no. 3, 1960), that for water from papers by J. M. Walsh, M.H. Rice (Ref. 6: J.Chem. Phys., 26, no. 4, April, 1957) and L.V. Al'tshuler, A.A. Bakanova, R.F. Trunin (Ref. 7: DAN SSSR, 121, no. 1, 1958). The dynamic adiabatic for paraffin was obtained by Yu. F.Alekseyev

S/057/61/031/006/012/019
B116/B203

X-ray study of the compressibility ...

and V. P. Krupnikova, and that for plexiglass by A.A. Bakanova and R. F. Trunin. The data obtained are tabulated. The authors thank Professor V. A. Tsukerman for advice given, A. I. Kuz'mich and B.A. Ushakov for assisting in the experiments, and A.A. Bakanova for a discussion. There are 9 figures, 1 table, and 8 references: 6 Soviet-bloc and 2 non-Soviet-bloc.

SUBMITTED: July 15, 1960

Card 5/5

18.8100 14.18 4016 1530
24.7500 1144 1160, 1482, 2108
1.1210 2808, 3008, 3108

26693
S/056/61/041/005/008/038
B109/B102

AUTHORS: Al'tshuler, L. V., Kormer, S. B., Bakanova, A. A., Petrunin, A. P., Funktikov, A. I., Gubkin, A. A.

TITLE: Irregular conditions of oblique collision of shock waves in solids

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1382 - 1393

TEXT: On the basis of papers by V. Blikney, A. Taub (Sb. Voprosy raketnoy tekhniki, 1, 1951), L. D. Landau, Ye. M. Lifshits (Mekhanika sploshnykh sred - Mechanics of Continuous Media, Gostekhizdat, 1954), O. S. Ryzhov, S. A. Khristianovich (PMM, 22, 586, 1958), Ya. B. Zel'dovich, Gandel'man, and Ye. A. Feoktistova (DAN SSSR, 136, 1325, 1961) the authors describe a method of producing and recording irregular conditions for the collision of shock waves in solids. The experimental arrangement is shown in Fig. 2a. The detonation waves which enter the specimen at a slant cause shock waves with amplitudes of between 3 and $4 \cdot 10^5$ atm. Another arrangement allowed reaching shock waves of $1 - 1.8 \cdot 10^6$ atm. The parameters of the

Card 1/3

26693
S/056/61/041/005/008/038
B109/B102

Irregular conditions of oblique ....

three-shock configuration forming as a result of the collision of the shock waves, are given for aluminum, lead, iron, and copper bodies. Near the critical angle at which a shock wave can still arise pressure was found to rise by from 6 to 8 times. When the waves have greater amplitudes, pressure in the collision region rises up to $4 \cdot 10^6$ atm in aluminum. In steel, copper, and lead it may even reach $7 \cdot 10^6$ atm if the waves collide at right angles. The results are analyzed by means of the method of the impact polars. It is shown that the picture with only one tangential discontinuity cannot be employed in describing the irregular conditions of the oblique collision of weak shock waves in the metal. The authors present a method of determining pressure and density behind the reflected wave front from the parameters of the three-shock configuration. Pressure and density for the collision of strong shock waves in aluminum were calculated as examples. It was found that the incident and reflected waves increase the density of aluminum up to 6.12 g/cm^3. M. P. Speranskaya, N. S. Tenigin (deceased), A. N. Kolesnikova, M. S. Shvetsov, L. N. Gorelova, and M. V. Sinitsyn are thanked for assistance and information. There are 14 figures, 3 tables, and 9 Soviet references.

SUBMITTED: May 18, 1961

Card 2/3

Card 1/2

volume. High-temperature tempering first removes internal stresses in twinning zones: these have the lowest recrystallization temperature. The intense - twinning zone is also formed in explosive deformation of specimens preheated to 700°C. Where explosion waves meet sideways or frontally, zones with great dynamic work-hardening are produced whose positions indicate zones of maximum explosive pressures; when pressures decrease rapidly or if the intensity of the meeting waves is reduced, white lines are produced on the macro-sections with fewer twins, surrounding or completely replacing dark zones: it is not clear which causes the white lines to appear. Some of the information obtained agrees with previously published work, most represents original material. Academician N.N.Davidenko and Professor V.A.Tsukerman gave valuable advice on this work. There are 12 figures.

SUBMITTED: July 29, 1961

34000
S/056/62/042/001/015/048
B104/B102

18.8100

AUTHORS: Al'tshuler, L. V., Bakanova, A. A., Trunin, R. F.

TITLE: Shock adiabats and zero isotherms of seven metals at high pressures

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 1, 1962, 91-104

TEXT: The wave velocity D and the mass velocity U behind the shock-wave front were measured in Fe, Ni, Cu, Zn, Cd, Sn, and Pb. Pressure and degree of compression were determined from $P = \varrho_0 DU$ and $\sigma = D/(D-U)$. By passing from the shock adiabat to the zero isotherm, the following simple equations were obtained for pressure and energy:

$$P_x(\delta) = Q\,[\delta^{2/3}\exp\{q(1-\delta^{-1/3})\} - \delta^{4/3}],$$

$$E_x(\delta) = (3Q/\rho_{0k})\,[q^{-1}\exp\{q(1-\delta^{-1/3})\} - \delta^{1/3}]$$

where Q and q are unknown constants, $\delta = v_0/v$, v being the specific volume,

Card 1/3

34000
S/056/62/042/001/015/048
B104/B102

Shock adiabats and zero isotherms...

and $v_0 = v$ at $P = 0$ and $T = T_0$. In the case of ionic compounds, the first terms in (5) determine the ionic repulsion potential and the second terms determine the Coulomb attraction. In the case of metals, the positive and the negative term in (5) express the repulsive and the attractive forces, respectively. Similar equations were obtained for transition metals in the same way. Shock adiabats and zero isotherms were approximated by a suitable combination of Q and q (Figs. 5 and 6). Using the equation $P_{x,extra} = b + B(\sigma - a)^n$, the zero isotherms were extrapolated into pressure and density ranges, to which quantum statistical methods are applicable. The extrapolation constants are presented in Table 8. K. K. Krupnikov, M. I. Brazhnik (ZhETF, 34, 886, 1958), S. B. Kormer, V. D. Urlin, L. T. Popova (FTT, 3, 223, 1961), V. S. Zharkov, and V. A. Kalinin (DAN SSSR, 135, 811, 1960) are mentioned. V. N. Zubarev is thanked for his assistance in interpreting experimental data, M. I. Brazhnik, A. A. Gubkin, and I. P. Dudoladov for their help in experiments and calculations, and S. B. Kormer and V. D. Urlin for discussions. There are 9 figures, 8 tables, and 14 references:

Card 2/5

34000
S/056/62/042/001/015/048
B104/B102

Shock adiabats and zero isotherms...

9 Soviet-bloc and 5 non-Soviet-bloc. The four most recent references to English-language publications read as follows: R. G. McQueen, S. P. Marsh. J. Appl. Phys. 31, 1253, 1960; J. M. Walsh et al. Phys. Rev. 108, 196, 1957; J. J. Gilvarry. Phys. Rev. 102, 317, 1956; J. S. Dugdale, D. K. McDonald. Phys. Rev., 89, 832, 1953.

SUBMITTED: August 10, 1961

Table 1. Experimental results. Legend: (1) shock-wave parameters.

Table 2. Experimental results. Legend: (1) material of impact mass; (2) velocity of impact mass.

Table 8. Extrapolation constants.

Fig. 5. Shock adiabats and zero isotherms of Ni and Zn.

Fig. 6. Shock adiabats and zero isotherms of Fe.

Card 3/5

S/181/63/005/001/043/064
B108/B180

AUTHORS: Al'tshuler, L. V., Pavlovskiy, M. N., Kuleshova, L. V., and Simakov, G. V.

TITLE: Study of alkali metal halides under the high pressures and temperatures of shock compression

PERIODICAL: Fizika tverdogo tela, v. 5, no. 1, 1963, 279-290

TEXT: To investigate the interaction forces of the ions of alkali halide salts the authors studied the shock compression of LiF, KCl, NaI, KBr, and CsI crystals in the pressure range $2 \cdot 10^{10} - 10^{12}$ bar. The pressure was created by exploding a charge which threw a steel plate against a metal screen on the other side of which the sample was attached. Phase transformation of KCl and KBr was observed during the shock compression, probably a transition from NaCl-type structure with coordination number 6 to CsCl-type structure with coordination number 8. There was considerable increase in internal energy of LiF, KBr, and CsI after the compression. The experimental data are used to derive semiempirical equations of state

Card 1/2

L 29987-65 EWT(1)/EWP(m)/EWT(m)/EPF(c)/EPF(n)-2/EWA(d)/EPR/T/EWP(t)/EWP(k)/FCS(k)/
EWP(b)/EWA(h)/EWA(c) Pz-6/Pd-1/Pf-4/Pr-4/Ps-4/Pi-4/Pu-4 IJP(c) JD/WW/HW/GG

ACCESSION NR: AP5006388 S/0053/65/085/002/0197/0258

AUTHOR: Al'tshuler, L. V.

TITLE: Application of shock waves in high-pressure physics

SOURCE: Uspekhi fizicheskikh nauk, v. 85, no. 2, 1965, 197-258

TOPIC TAGS: high pressure, shock wave, high pressure physics, compression, explosion, phase transformation, adiabatic

ABSTRACT: The present review of the application of shock waves in high-pressure physics is based on 169 references, of which over 50 percent are Soviet. The review is divided into eleven sections: shock adiabatics and their experimental determination; methods of obtaining semiempirical equations of state; detonation of condensed explosives and shock compression of superdense gases; shock adiabatics and null isotherms of metals; sound velocity and isentropic elasticity of shock-compressed bodies; collisions of shock waves; peculiarities of flows with phase transitions and phase transformations in iron; equations of state and phase transformations of ionic crystals; transitions into a metallic state; composition of the earth's nucleus and mantle; and

Card 1/2

L 29987-65

ACCESSION NR: AP5006388

dynamic strength of materials. X-ray diffraction pattern studies and the optical properties of shock-compressed materials are not discussed. Orig. art. has: 65 figures, 10 formulas, and 8 tables. [CS]

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: ME

NO REF SOV: 084 OTHER: 085 ATD PRESS: 3197

Card 2/2

L 32210-66 EWT(1)/EWP(m) WW
ACC NR: AP6020795 (A) SOURCE CODE: UR/0386/66/003/012/0483/0487

AUTHOR: Al'tshuler, L. V.; Bakanova, A. A.; Dudoladov, I. P.

ORG: none

68
65
B

TITLE: Peculiarities of shock compression of lanthanides

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 12, 1966, 483-487

TOPIC TAGS: lanthanide series, lanthanum, cerium, samarium, dysprosium, erbium, second order phase transition, adiabatic compression, high pressure, critical pressure, mechanical shock resistance

ABSTRACT: The authors report the first results of an investigation of the dynamic compressibility of La, Ce, Sm, Dy, and Er up to 3.5 Mbar pressure. The shock-compression parameters were obtained by the reflection method (L. V. Al'tshuler, Uspekhi fiz. nauk v. 85, 197, 1965 and earlier) using apparatus described elsewhere (ZhETF v. 38, 790, 1960 and Fiz. tverdogo tela v. 5, 279, 1963). The directly measured quantities were the velocities d of the shock wave in the investigated metals. These were used to determine the mass velocities u, the shock compression pressures P, and the degrees of compression σ. The d-u plot of each of the lanthanides, obtained from the experimental data, is represented with high

Card 1/2

L 32210-66
ACC NR: AP6020795 (A) 3

accuracy by two straight-line segments of different slopes. The slopes and intercepts of all the segments are determined and tabulated. The shock adiabats were also plotted for Sm, Dy, and Er, for which the change in slope of the d-u plot was most pronounced. The adiabats exhibit kinks near the critical pressures, indicating the presence of a second-order phase transition. The more gently sloping sections of the adiabats are probably determined by the compression of the external low-density 6S shells and by the simultaneously occurring redistribution of the electrons among the bands. The change in slope at the critical pressure signifies the completion of these processes and the formation of low-compressibility electronic configuration. A more complete interpretation of the data calls for calculation of the energy spectra of the compressed metals. The authors thank Corresponding Member of the Academy of Sciences SSSR, Professor N. P. Sazhin, as well as Engineers L. A. Dolomanov and V. M. Murav'yeva for interest and collaboration. Orig. art. has: 2 figures, 2 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 25Apr66/ ORIG REF: 008/ OTH REF: 003

Card 2/2

L 18832-66 EWT(m)/EWP(t)/EWP(k) IJP(c) JD/HW

ACC NR: AP6003485 (A) SOURCE CODE: UR/0020/66/166/001/0067/0070

AUTHOR: Al'tshuler, L. V.; Novikov, S. A.; Divnov, I. I.

104
B

ORG: none

TITLE: The relationship between critical breaking point and rupture time in explosively loaded metals

14,44

SOURCE: AN SSSR. Doklady, v. 166, no. 1, 1966, 67-70

TOPIC TAGS: explosive forming, copper, mechanical shock resistance, ductility, rupture strength, shock wave velocity, pressure gradient

ABSTRACT: Ductile cleavage during impact loading in copper 27 was studied. The study was undertaken in view of the fact that previous studies on cleavage have failed to provide clear criteria for rupture. Copper sheets (between 6 to 10 mm thick) were explosively formed under different loading conditions resulting in a variation of critical rupture pressure from 35.5 to $78 \cdot 10^3$ atm. A theoretical analysis is presented for the relationship between critical breaking point and rupture time based on plastic shock wave velocity and its interaction with surface barriers. Ductile cleavage resulting from explosive loading is graphed. A graph of time as a func-

Card 1/2 UDC: 539.411.5

2

L 18832-66

ACC NR: AP6003485

tion of Lagrange coordinate distance is given in which the shock wave is shown in various positions for various conditions, including ductile cleavage formation; rupture time was determined from this graph by drawing a line parallel to the time axis from the minimum in the rupture curve to the intersection with the negative pressure wave line (characteristic of the boundary). Similar graphs were made for clad metals, considering the effects of the collisions of the shock waves with the interfering boundaries. A detailed analysis was given for copper clad with aluminum with an additional plot of pressure as a function of wave velocity. The critical rupture pressure was calculated by means of the expression

$$P_{cr} = \rho_0 c_0 (w_0 - \bar{w}_0)$$

where ρ_0 and c_0 are the values of the density and speed of sound in the material; w_0 and $\bar{w}_0$ are the initial and average velocities of the shock wave at the free surface. Test data on explosively deformed copper sheets are presented in which the critical rupture pressure was calculated from the above equation for various charge distributions, varying sheet thicknesses and wave velocities. The dependence of the rupture time on the value of the negative pressure (reflected wave) was plotted. It is concluded that the resistance of the metal to rupture is not a function of its strength but is dependent on the pressure gradient and the shock wave velocity. Orig. art. has: 4 figures, 2 tables.

SUB CODE: 11/ SUBM DATE: 19Apr65/ ORIG REF: 006/ OTH REF: 003

Card 2/2 vmb

POPOVICH, G. [Popovych, H.], kand.tekhn.nauk; NOGIN, S. [NOHIN, S.], inzh.; ALTSHULER, M., inzh.

Using the ultrasonic method in testing the strength of concrete construction elements. Bud.mat.i konstr. 2 no.1: 47-52 F '60. (MIRA 13:6)

(Ultrasonic waves--Industrial applications)
(Precast concrete--Testing)

AL'TSHULER, M. A.

"Trends Toward Perfecting the Technology of Mining Ores in Shafts of the Krivoi Rog Basin," Gor. Zhur., No. 5, 1949. Mining Engineer.

AL'TSHULER, M.A.; TARAN, P.N.

Increasing labor productivity in the Frunze mine. Gor.zhur.no.3: 10-13 Mr '56. (MIRA 9:7)

1.Glavnyy inzhener rudoupravleniya imeni Frunze (for Al'tshuler).
2.Glavnyy inzhener tresta Leninruda (for Taran).
(Frunze--Iron mines and mining)

TITOV, V.D., gornyy inzhener; TARAN, P.N., gornyy inzhener; ZYMALEV, G.S., gornyy inzhener; OSTROUKHOV, A.I., gornyy inzhener; AL'TSHULER, M.A., gornyy inzhener; BORZENKO, P.V., gornyy inzhener.

"Underground mining of ore and placer deposits" by R.P. Kaplunov and other. Reviewed by V.D. Titov and others. Gor.zhur.no.11:63-64 N '56. (MLRA 10:1)

(Mining engineering--Study and teaching)

(Kaplunov, ~~R.P.~~)

AL'TSHULER, M.A., inzhener; BORZENKO, P.V., inzhener; PEREYASLAVSKIY, N.R., inzhener.

Improving hard ore mining. Bezop. truda v prom. 1 no.4:15-18 Ap '57. (MLRA 10:6)
(Mining engineering)

AL'TSHULER, Mikhail Abramovich, kand.tekhn.nauk; SOSEDOV, O.O., red.; SMOLDYREV, A.Ye., red.izd-va; MIKHAYLOVA, V.V., tekhn.red.

[Underground exploitation of thick layers of hard ore] Podzemnaia razrabotka moshchnykh zalezhei krepkikh rud. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1958. 235 p. (MIRA 11:7)

(Mining engineering)

AL'TSHULER, M.A.

Dissertations. Dept. of Technical Sciences, Jul-Dec 1957.
Vest. Ak Nauk SSSR, 1958, No. 4, pp.123-123 (USSR)

At the Mining Institute the following dissertations were defended:
for the degree of Doctor of Technical Sciences:

A. Ch. MUBIN - Investigation of the System With Open Purification Space With Adaption to the Exploitation of Sloped Deposits of Dzhezkazgan.

M. A. AL'TSHULER - Improvement of the Exploitation System by Means of Mine Production.

F. A. BARSUKOV - Investigation of the Important Parameters of the Subterranian Extraction by Means of Deep Gaps in the Exploitation of Thick Deposits of Solid Ores With a Magnetic Anomaly of Kursk.

V. I. GOLOMOLZIN - Determination of the Optimum Parameters of the Pits Under the Condition of the Krasnoarmeysk District of the Donets Basin.

O. P. NIKONOV - Investigation of the Hollowing Out of Uncovered Rocks in a Hydraulic Excavator Exploitation of Coal Deposits.

A. D. POMORTSEV - Investigation of the Suitability of the Exploitation of Steep Layers of a Thickness of 2-4, by Means of a Shield System.

SOV/127-59-1-2/26

AUTHOR: Al'tshuler, M. A., Candidate of Technical Sciences

TITLE: Ways of Raising Labor Productivity in the Krivoy Rog Basin Mines (Puti povysheniya proizvoditel'nosti truda na shakhtakh Krivorozhskogo basseyna)

PERIODICAL: Gornyy zhurnal 1959, Nr 1, pp 7-11 (USSR)

ABSTRACT: Labor productivity in the mining industry of the Krivoy Rog basin only slightly increased in the last few years in spite of the introduction of new working methods, new machinery and the mechanization of various mining operations. It can be explained by the shortcomings in production organization and technological processes. Inadequate mechanization of auxiliary and labor consuming work, and the necessity of transferring mining operations to the much deeper levels were also contributing factors. After proposing different improvements in various branches of mining operation, the author concludes that for the further improvement of production organization, more independence should be given to managers and engineering-technical personnel in the solution of all technical and economical problems; the number of auxiliary workers must be greatly reduced and the workers'

Card 1/2

SOV/127-59-1-2/26

Ways of Raising Labor Productivity in the Krivoy Rog Basin Mines

compound brigades should be extended. There are 3 tables.

ASSOCIATION: Dnepropetrovskiy sovnarkhoz (The Dnepropetrovsk Sovnarkhoz)

Card 2/2

CHERNENKO, A.R.; SIMFOROV, G.Ye.; SHKUTA, E.I.; TEREKHOV, I.P.; POLYANSKIY, F.S.; PISANKO, K.S.; SHENDRIK, V.K.; AL'TSHULER, M.A.; RIVKIN, I.D.; ENGEL', Ya.R.; CHETYRKIN, M.I., red.izd-va; PYL'NEN'KIY, A.A., red.izd-va; OSVAL'D, E.Ya., red.izd-va; PROZOROVSKAYA, V.L., tekhn.red.

[Sharp increase in the labor productivity of Krivoy Rog Basin miners; practices in the "Bol'shevik" and "Gigant" mines] Krutoi pod"em proizvoditel'nosti truda gorniakov Krivbassa; iz opyta raboty shakht "Bol'shevik" i "Gigant." Moskva, 1960. 173 p. (MIRA 13:11)
(Krivoy Rog Basin--Iron mines and mining--Labor productivity)

VINOGRADOV, V.S., inzh.; AL'TSHULER, M.A., kand. tekhn. nauk; POLYAKOV, V.G., inzh.; KUROCHKIN, A.N., inzh.; KARMAZIN, V.I., doktor tekhn. nauk; ZAIKIN, S.A., inzh.; OSTROVSKIY, G.P., inzh.[deceased]; NAUMENKO, P.I., inzh.; BOBRUSHKIN, L.G., inzh.; RUSTAMOV, I.I., inzh.; SHIFRIN, I.I., inzh.; GOLOVANOV, G.A., inzh.; KRASOVSKIY, L.A., inzh.; TSIMBALENKO, L.N., inzh.; RAVIKOVICH, I.M., inzh.; BAZILEVICH, S.V., kand. tekhn.nauk; ZORIN, I.P., inzh.; ZUBAREV, S.N., inzh.; TIKHDVIDOV, A.F., inzh.; SHITOV, I.S., inzh.; GAMAYUROV, A.I., inzh.; KUSEMBAYEV, Kh.N., inzh.; DEKHTYAREV, S.I., inzh.; VORONOV, I.S., inzh.; BURMIN, G.M., inzh.; BARYSHEV, V.M., inzh.; GOLOVIN, Yu.P., inzh.; MARCHENKO, K.F., inzh.; RYCHKOV, L.F., inzh.; NESTERENKO, A.M., inzh.; KABANOV, V.F., inzh.; PATRIKEYEV, N.N., inzh.[deceased]; ROSSMIT, A.F., inzh.; SOSEDOV, O.O., inzh.; POKROVSKIY, M.A., inzh., retsenzent; POLOTSK, S.M., red.; GOL'DIN, Ya.A., glav. red.; GOLUBYATNIKOVA,G.S., red. izd-va; BOLDYREVA, Z.A., tekhn. red.

[Iron mining and ore dressing industry]Zhelezorudnaia promyshlennost'. Moskva, Gosgortekhizdat, 1962. 439 p. (MIRA 15:12)

1. Moscow. TSentral'nyy institut informatsii chernoy metallurgii. (Iron mines and mining) (Ore dressing)

AL'TSHULER, M.A., kand.tekhn.nauk

Ways of increasing labor productivity at Krivoy Rog Basin mines.
Gor.zhur. no.1:10-15 Ja '65. (MIRA 18:3)

1. Pridneprovskiy sovet narodnogo khozyaystva, Dnepropetrovs .

AL'TSHULER, M.A.

Theory of the capillary impregnation by wetting liquids of porous materials having dead-end capillaries. Koll.zhur. 23 no.6:646-651 N-D '61. (MIRA 14:12)

1. Nauchno-issledovatel'skiy institut vnedreniya peredovogo opyta v stroitel'stvo i tekhnicheskoy informatsii, Kiyev.

(Porous materials) (Capillarity)

ZAYTSEVA, K.A.; SHULEPOV, Yu.V.; AL'TSHULER, M.A.

Deposition of aerosols from laminar flow under the effect of gravity.
Koll.zhur. 23 no.6:687-689 N-D '61. (MIRA 14:12)

1. Institut obshchey i neorganicheskoy khimii AN USSR, Kiyev.
(Aerosols) (Laminar flow)

AL'TSHULER, M.A., inzh.

Kinetics of capillary impregnation of spherical granules and diffusion extraction from them. Nauch. zap. Ukrniiproekta no.9: 125-129 '62. (MIRA 16:7)
(Capillarity) (Extraction (Chemistry))

DERYAGIN B.V.; AL'TSHULER, M.A.

Diffusin extraction from porous materials in the process of capillary impregnation. Dokl. 146 no.1:139-142 S '62.
(MIRA 15:9)

1. Institut fizicheskoy khimii AN SSSR i Ukrainskiy nauchno-issledovatel'skiy proyektnyy institut. 2. Chlen-korrespondent AN SSSR (for Deryagin).
(Porous materials) (Extraction (Chemistry))

DERYAGIN, B.V.; AL'TSHULER, M.A.

Effect of the physicochemical properties of entrapped gases on the impregnation of porous bodies. Dokl. AN SSSR. 152 no.4: 911-914 O '63. (MIRA 16:11)

1. Institut fizicheskoy khimii AN SSSR. 2. Chlen-korrespondent AN SSSR (for Deryagin).

DERYAGIN, B.V.; AL'TSHULER, M.A.

On the capillary impregnation of spherical granules and diffusion extraction while in the stage of capillary impregnation. Dokl. AN SSSR 152 no.3:651-654 S '63. (MIRA 16:12)

1. Institut fizicheskoy khimii AN SSSR. 2. Chlen-korrespondent AN SSSR (for Deryagin).

ALTSHULER, M.A.; MATSKEVICH, Ye.S.; IVANOVA, L.S.

Adsorption of dissolved substances by porous materials in the process of their capillary imbibition. Koll. zhur. 27 no.4:485-488 Jl-Ag '65. (MIRA 18:12)

1. Institut fizicheskoy khimii AN UkrSSR imeni L.V. Pisarzhevskogo, Kiyev, Ukrainskiy nauchno-issledovatel'skiy i proyektnyy institut neftyanoy i neftekhimicheskoy promyshlennosti. Submitted Febraury 29, 1964.

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S/058/61/000/001/003/008
A001/A001

Translation from: Referativnyy zhurnal, Fizika, 1961, No. 1, p. 265,#1D152

AUTHORS: Ar'yev, A. M., Al'tshuler, M. B.

TITLE: On the Problem of Changing the Polyethylene Structure by Plane-Parallel Tension

PERIODICAL: "Tr. Novocherk. politekhn. in-ta", 1959, Vol. 73. "Raboty Kafedry fiz.", pp. 173-179

X

TEXT: The authors plotted distribution curves of intensities, by scattering angles, for the initial polyethylene and for ethylene subjected to plane-parallel tension. For these two cases, the curves of radial distribution of atomic density are calculated. Maxima corresponding to interatomic distances and maxima of intermolecular distances were revealed in the curves. It is established that the mutual arrangement of polymer chains changes as a result of plane-parallel tension. The new arrangement of the chains is due to an increasing content of crystalline phase and the appearance of two new maxima of the distribution curve which were absent in the corresponding curve for the initial substance.
Translator's note: This is the full translation of the original Russian abstract.

Card 1/1

Al'tshuler, M.M.

The problem of absorption [illegible]

of absorption of CO_2 by a drop of water was investigated. By this effect is understood an increase in absorption taking place at the expense of spattering of the drop at the moment of hitting an obstacle. It is assumed that this effect [illegible]

454

AL'TSHULER, M.M.; CHERNYAK, E.Yu.

Potentialities of labor productivity growth in boring at the Moscow Basin "Podzemgaz" plant. Podzem.gaz.ugl. no.1:73-75 '57. (MIRA 10:7)

1. VNIIPodzemgaz.
(Moscow Basin--Coal gasification, Underground) (Boring)

AL'TSHULER, M.M.; SHMAKOVA, Ye.K., kandidat ekonomicheskikh nauk.

Effectiveness of underground coal gasification in the Moscow Basin.
Podzem.gaz.ugl. no.2:105-110 '57. (MIRA 10:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut Podzemgaz.
(Moscow Basin--Coal gasification, Underground)

AL'TSHULER, M.M.; LESHCHINER, R.Ye.; CHERNYAK, E.Yu.

Outlook for the development of underground gasification of coal in the Turgay Basin. Podzem.gaz.ugl. no.3:45-46 '57. (MIRA 10:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy i proyektnyy institut podzemnoy gazifikatsii ugley.
(Turgay Gates--Coal gasification, Underground)

Al'tshuler, MM

AL'TSHULER, M.M.

Methods for determining the national economic effectiveness of underground gasification of coal. Podzem.gaz.ugl. no.4: 63-66 '57. (MIRA 11:1)

1.Vsesoyuznyy nauchno-issledovatel'skiy institut Podzemgaz.
(Coal gasification, Underground)

AL'TSHULER, M.M.

"Fuel economics in the U.S.S.R. by G.D. Bakulev. Reviewed by M.M. Al'tshuler. Podzem.gaz.ugl. no.4:72-73 '57. (MIRA 11:1)

1.Vsesoyuznyy nauchno-issledovatel'skiy institut Podzemgaz.
(Fuel)

AL'TSHULER, M.M.

Prospects for developing underground coal gasification in Central Kazakhstan. Podzem. gaz. ugl. no.3:65-68 '58.
(MIRA 11:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut Podzemgaz.
(Kazakhstan--Coal gasification, Underground)

ALTSHULER, M.M.; BRUSHTEYN, N.Z., kand. tekhn. nauk; ARANDARENKO, N.F.

Economic efficiency of using enriched blowing in underground lignite gasification. Podzem. gaz. ugl. no.1:67-71 '59.
(MIRA 12:6)

1.VNIIPodzemgaz.
(Coal gasification, Underground)
(Oxygen--Industrial applications)

AL'TSHULER, M.M.; MIKHAYLOVA, G.N.; CHERNYAK, E.Yu.

Technical and economic analysis of the operations of "Podzemgaz" plants located in coal deposits during 1960. Nauch. trudy VNII Podzemgaza no.6:108-114 '62. (MIRA 15:11)

1. Sektor tekhniko-ekonomicheskiy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.
(Coal gasification, Underground)

AL'TSHULER, M.M.; LESHCHINER, R.Ye.

Some problems of the economics of the chemical processing of gas produced by underground coal gasification. Nauch.trudy VNIIPodzemgaza no.7:83-96 '62. (MIRA 15:11)

1. Sektor tekhniko-ekonimicheskiy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.
(Coal gasification, Underground) (Gas research)

AL'TSHULER, M.M.; KALMANOVA, Yu.D.; MIKHAYLOVA, G.N.; CHERNYAK, E.Yu.

Technical and economic analysis of the work of the underground gásification stations in 1961. Nauch. trudy VNIIPodzemgaza no.8:80-87 '62. (MIRA 16:6)

1. Sektor tekhniko-ekonomicheskiy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.
(Coal gasification, Underground—Accounting)

AL'TSHULER, M.M.

Methodology for calculating the cost of gas from underground gasification of coals. Nauch. trudy VNIIPodzemgaza no.8: 104-107 '62. (MIRA 16:6)

1. Sektor tekhniko-ekonomicheskiy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.
(Coal gasification, Underground—Costs)

ALITSHULER, M.M.; KALMANOVA, Yu.D.; MIKHAYLOVA, G.M.; CHERNYAK, E.Yu.

Analysis of the operation of working "Podzemgaz" plants in 1962. Trudy VNIIPodzemgaza no.12:151-160 '64. (MIRA 18:9)

1. Sektor tekhniko-ekonomicheskiy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.

AL'TSHULER, M.M.; MIKHAYLOVA, G.N.; OVSYANNIKOV, V.I.; CHERNYAK, E.Yu.; UTKINA, L.D.

Technical and economic analysis of operations in the "Podzemgaz" plants of Angren, Yuzhno-Abinskaya, and Lisichansk. Trudy VNIIPodzemgaza no.13:107-116 '65. (MIRA 18:8)

1. Laboratoriya tekhniko-ekonomicheskikh issledovaniy Vsesoyuznogo nauchno-issledovatel'skogo instituta podzemnoy gazifikatsii ugley.

ALTSHULER, M. Z.

PROCESSES AND PROPERTIES INDEX

4

Formation of acetylene in the electrocracking of methane. I. Static experiments. R. N. Bremin, M. Z. Altshuler, Z. I. Kir'yashkina, and V. V. Igonin. *J. Applied Chem.* (U.S.S.R.) 20, 5-22(1947)(in Russian).—The balance and the products of cracking of natural gas (90.81 to 93.87 vol. % CH_4, 2.81-2.54 C_2H_6, 5.92-3.2 N_2) in an elec. arc, between W wire and brass tube electrodes were investigated in a closed spherical Pyrex flask of vol. v = 12 l. or 6 l., under reduced initial pressures p of 35, 75, 100, and 150 mm. Hg at currents i, of 0.3, 0.6, and 0.9 amp.; electrode spacing l = 15, 30, and 60 mm. (1) In terms of the duration τ(sec.) of the arc, the concn. A of C_2H_2 (in vol. %) in the product passes through a max., highest (A = 18%, corresponding to a yield of about 70% with respect to the initial CH_4) under p = 35 mm.; higher p lower A_{max} (e.g. to 14.5% and 12.4% at p 100 and 150; l 30) and lengthen the time τ_{max} necessary to attain A_{max} (1.5-fold increase between 35 and 100 mm.), but there is no direct proportionality. At higher p, smaller A_{max} correspond to smaller values of the total cracking $\theta = 100(c - \beta[CH_4])/c$ [where c = content of CH_4(+ C_2H_6) in the initial gas, β = coeff. of expansion (after cooling) due to the reaction = p(final)/p(initial)], and to smaller values of the "useful cracking" $\sigma = 100 \times 2\beta([C_2H_2] + [C_2H_4])/(c - \beta[CH_4])$ (giving the percentage of CH_4 reacted, converted into C_2H_2 + C_2H_4), but to larger values of "cracking to carbon" = $100\theta(1-\sigma)$; the latter process is the result of a decompn. of the C_2H_2 formed; the equality of the rates of formation and decompn., which dets. the max., is understandably reached at an A the lower the higher p. (2) Under 35 mm., A_{max} does not appreciably depend on v and l but τ_{max} is directly proportional to v and inversely to l; under 100 mm., A_{max} depends on v/l: with v/l = 2 l./15 mm. and 6 l./30 mm., A_{max} = 16.0 and 16%, resp., while with v/l = 2/30, A_{max} = 14.8. Under 150 mm., τ_{max} still varies directly with v and inversely with l but no longer proportionally; A_{max} again is greatest with v = 2 l., l = 15 mm., smallest with v = 2, l = 30. (3) Variation of i from 0.3 to 0.9 at const. v 2, l 60, p 35 and from 0.3 to 0.6 at const. v 2, l 30, p 100, produced only a very slight lowering of A_{max} at the higher i; τ_{max} appears to be approx. inversely proportional to i, e.g. i 0.3 and 0.6, at p 35, τ_{max} = 10 and 5 sec., at p 100, τ_{max} = 30 and 15 sec. Essential conclusions are: (*a*) in spherical reactors, high A (18%) can be attained in relatively long τ (about 2 min.), as against the very short τ (0.4-0.0001 sec.) imposed in tubular vessels; (*b*) the true rate of the elec. cracking reaction is independent of v, proportional to l and to i; (*c*) in spherical reactors, the gas leaving the arc zone has a final mean A resulting from mixing through convection currents; (*d*) from the exptl. kinetic curves, an increase of A from 7 to 14% (under p 35, v 2, l 15, i 0.3) requires 9.5 sec., its decrease from 14 to 7 (through decompn.), 400 sec.; thus, the mean rate of formation of C_2H_2 is 48.4 times its rate of decompn.; under p 100 and 150, the ratios are 25.2 and 16.7, resp.; i.e., higher p accelerates the decompn. (4) Plotted against τ, θ reaches a const. max. in about 30 sec. and does not

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

5(3) SOV/20-124-3-29/67

AUTHORS: Tinyakova, Ye. I., Dolgoplosk, B. A., Corresponding Member, Academy of Sciences, USSR, Marey, A. I., Al'tshuler, M. Z.

TITLE: The Production of Crystalline 1-4-Transpolybutadiene and -Polyisoprene and the Investigation of Their Properties (Polucheniye kristallicheskikh 1-4-trans-polibutadiyena i poliizoprena i izucheniye ikh svoystv)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 595-597 (USSR)

ABSTRACT: A description is given of the production of the symmetric 1-4-transpolymers of butadiene and isoprene by the aid of oxide catalysts, in particular of chromium oxides on aluminium silicate. - Polyisoprene is stable, its infrared spectrum shows that 99% of the polymer chain possesses the 1-4 trans-configuration. The iodine number corresponds with the theory. Due to the uniform structure, the polymer crystallizes, which could be confirmed by the x-ray photograph. This x-ray photograph is analogous to that of natural β-gutta percha. - Polybutadiene is a crystalline-fibrous substance. As it is difficultly soluble it was pressed into a film

Card 1/3

SOV/20-124-3-29/67

The Production of Crystalline 1-4-Transpolybutadiene and -Polyisoprene and the Investigation of Their Properties

prior to the photographing of its infrared spectrum. The spectrum confirms the 1-4 trans-configuration. A curve of the deformation on repeated intensive heating was plotted. A table gives the density changes brought about by heating. The infrared spectrum of polyisoprene was photographed by K. V. Nel'son, and that of polybutadiene by Ye. I. Pokrovskiy, and the x-ray photographs were made by L. A. Volkova. There are 2 figures, 1 table, and 3 references, 1 of which is Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR (Institute of High Molecular Compounds of the Academy of Sciences, USSR)
Vsesoyuznyy nauchno-issledovatel'skiy institut sinteticheskogo kauchuka im. S. V. Lebedeva
(All-Union Research Institute for Synthetic Caoutchouc imeni S. V. Lebedev)

Card 2/3

L 12777-63 EPR/EWP(j)/EPF(c)/EWT(l)/EWT(m)/BDS AFFTC/ASD/ESD-3/
APGC Ps-4/Pc-4/Pr-4 RM/WW
ACCESSION NR: AP3001528 S/0032/63/029/006/0710/0712

80
77

AUTHOR: Al'tshuler, M. Z.; Marey, A. I.; Nel'son, K. V.; Skripova, L. S.

TITLE: Study of thermal structuration in insoluble polymers by quantitative infrared analysis

SOURCE: Zavodskaya laboratoriya, v. 29, no. 6, 1963, 710-712

TOPIC TAGS: thermal structuration, insoluble polymer, infrared analysis, thermovulcanization, divinyl rubber, potassium bromide

ABSTRACT: An earlier development, the so-called "powder-state method," was used for qualitative determination of the microstructure of insoluble samples of polybutadienes. Soluble samples of rubbers, the structure of which was determined by infrared spectroscopy of their solutions, served as standards. Divinyl rubber samples of 0.005 gm were subjected to pressure trituration with 2 gm of potassium bromide, which served as an abrasive. This was facilitated by the addition of some carbon tetrachloride, lowering the elasticity of the insoluble polymers. The infrared spectra of the thus treated SKB rubber before and after 4 hours heating at 250 and 280C showed that at 250C there takes place a break of double bonds in the 1,2 position, while those in trans-position remain unaffected.

Card 1/2

L 12777-63
ACCESSION NR: AP3001528

3

On the other hand, at a vulcanization temperature of 280C both the vinyl and the inside double bonds are ruptured, with a simultaneous increase in CH sub 2 groups. A study of the thermovulcanization of cis-1,4-divinyl rubber showed that with an increase in temperature and heat duration the number of cis-1,4-links decreases considerably due to their rupture and transformation into the trans-form. Besides, there also takes place a break in the few double bonds in the position 1,2. The paper was presented at the conference on spectroscopy in Gor'kiy, June 5-12, 1961. N. G. MartemMM'yanova participated in the work. Orig. art. has: 2 charts.

ASSOCIATION: Nauchno-issledovatel'skiy institut sinteticheskogo kauchuka (Scientific Research Institute of Synthetic Rubber)

SUBMITTED: 00 DATE ACQ: 17Jun63 ENCL: 04

SUB CODE: 00 NO REF SOV: 002 OTHER: 003

Card 2/82

AL'TSHULER, N.S.

Interprovince conference on tuberculosis in Khabarovsk. Probl.tub. no.3:74-75 My-Je '55. (MIRA 8:8)
(TUBERCULOSIS)

AL'TSHULER, N.S.

ASEYEV, D.D., professor; BERLIN, I.I., professor; VOZNESENSKIY, A.N., professor; SOROKIN, I.E., professor; UGRYUMOV, B.P., professor; TOPCHAN, A.B., professor; AGAPKIN, I.N., kandidat meditsinskikh nauk; AGRACHEV, G.I., kandidat meditsinskikh nauk; AL'TSHULER, N.S., kandidat meditsinskikh nauk; BERENZON, Ya.Ye., kandidat meditsinskikh nauk; ZORIN, Ye.N., kandidat meditsinskikh nauk; KOROVINA, Yu.P., kandidat meditsinskikh nauk; KOSITSKIY, G.I., kandidat meditsinskikh nauk; MANDEL'SHTAM, F.M., kandidat meditsinskikh nauk; MOCHALOVA, T.P., kandidat meditsinskikh nauk; OHLOGINA, Ye.Ya., kandidat meditsinskikh nauk; PATSKHVEROVA, A.G., kandidat meditsinskikh nauk; POKOTILOV, K.Ye., kandidat meditsinskikh nauk; ROZANOVA, M.D., kandidat meditsinskikh nauk; SAKHAROV, A.N., kandidat meditsinskikh nauk; YASHCHENKO, T.N., kandidat meditsinskikh nauk

"Tuberculosis"; handbook for physicians edited by Z.A.Lebedeva and N.A.Shmelev. Reviewed by D.D.Azeev and others. Probl.tub. 34 no.2: 76-80 Mr-Ap '56. (MLR 9:8)
(TUBERCULOSIS) (LEBEDEVA, Z.A.) (SHMELEV, N.A.)

ALʼTSHULER, N.S., kand.med.nauk; MARGULIS, N.Yu., nauchnyy sotrudnik

Work of a research institute in training personnel. Zdrav.Ros. Feder. 2 no.4:26-31 Ap '58. (MIRA 11:4)

1. Iz Moskovskogo gosudarstvennogo nauchno-issledovatel'skogo instituta tuberkuleza Ministerstva zdravookhraneniya RSFSR (dir. V.F.Chernyshev, zamestitel' direktora po nauchnoy chasti - prof. D.D.Aseyev).

(MEDICINE--STUDY AND TEACHING)

EXCERPTA MEDICA Sec 15 Vol 12/6 Chest Dis. June 59

1536. ALEXANDER DOBROV'S DISSERTATION ON TUBERCULOSIS CUTIS (Russian text) - Altshuler N.S. and Tereshkovich V.O. - VESTN. DERM. VENER. 1958, 32/2 (31-32)

A historical reminiscence of A. Dobrov's dissertation presented in the year 1862. This was one of the first dissertations on that theme written in the Russian language, and contained interesting clinical observations. (Dissertations before the year 1860 were written in Latin).

Kraus - Hradec Králové (XIII, 15)

AL'TSHULYER, N.S., kand.med.nauk

Problems of tuberculosis in the local newspapers in 1956.
Probl.tub. 36 no.4:118-122 '58 (MIRA 11:7)

1. Iz Moskovskogo nauchno-issledovatel'skogo instituta tuberculeza Ministerstva zdravookhraneniya RSFSR (dir. V.V. Chernyshov, zamestitel' direktora po nauchnoy chasti - prof. D.D. Aseyev).
(TUBERCULOSIS, prev. & control
role of newspapers in Russia (Rus))

AL'TSHULER, N.S., kand.med.nauk

First conference on science and practice for physicians in tuberculosis sanatoria of the R.S.F.S.R. Probl.tub. 36 no.6:123-127 '58
(TUBERCULOSIS) (MIRA 11:10)

AL'TSHULER, N.S.; LITOVCHENKO, O.V.; YUKELIS, I.I.; DUBOVSKOY, P.A.; PLETITSYNA, T.G.; BAGNOVA, M.D.; KOZEL'SKAYA, I.A.

Dynamics of tuberculosis of the skin in children in 1921-1954.
Vest.derm.i ven. 33 no.6:23-29 N-D '59. (MIRA 13:12)
(SKIN--TUBERCULOSIS)

AL'TSHULER, N.S.

Interprovince conference on tuberculosis control in regions of the Far North. Zdrav. Ros. Feder. 4 no.9:44-46 S '60. (MIRA 13:9)
(RUSSIA, NORTHERN—TUBERCULOSIS)

ASEYEV, D.D., prof.; AL'TSHULER, N.S., kand.med.nauk; ZAVELEVA, F.D., kand.med.nauk

Experience with a total examination of the population of the city of Klin. Probl.tub. 38 no.8:16-23 '60. (MIRA 14:1)

1. Iz Moskovskogo nauchno-issledovatel'skogo instituta tuberkuleza (dir. V.F. Chernyshev, zam. dir. po nauchnoy chasti prof. D.D. Aseyev).

(KLIN—TUBERCULOSIS—DIAGNOSIS)

CHERNYSHEV, V.F., kand.med.nauk; AL'TSHULER, N.S., kand.med.nauk

State and prospects of tuberculosis control. Med. sestra 20 no.9: 3-8 S '61. (MIRA 14:10)

1. Iz Moskovskogo gosudarstvennogo nauchno-issledovatel'skogo instituta tuberkuleza Ministerstva zdravookhraneniya RSFSR.
(TUBERCULOSIS)

AL'TSHULER, N.S., kand.med.nauk

Some new organizational patterns and methods of tuberculosis control in the R.S.F.S.R. Zdrav. Ros. Feder. 6 no.2:13-17 F '62. (MIRA 15:3)

1. Iz Moskovskogo nauchno-issledovatel'skogo instituta tuberkuleza.Ministerstva zdravookhraneniya RSFSR (dir. - kand.med. nauk T.P. Mochalova).

(TUBERCULOSIS)

AL'TSHULER, N.S. (Moskva)

Some information about the history of the Kr.inka health resort. Vop. kur., fizioter. i lech. fiz. kul't. 27 no.1:61-62 '62. (MIRA 15:5)

(KRAINKA (TULA PROVINCE)--MINERAL WATERS)

AL'TSHULER, N. S. (Candidate of Medical Sciences, Moscow Scientific Research Tuberculosis Institute of the Ministry of Public of the RSFSR)

"Problems of medical and veterinary workers in the control of tuberculosis"

Veterinariya, vol. 39, no. 5, May 1962 pp. 50

AL'TSHULER, N.S., kand. med. nauk

Tasks of medical and veterinary workers in the control of tuberculosis. Veterinariia 39 no.5:50-53 My '62 (MIRA 18:1)

1. Moskovskiy nauchno-issledovatel'skiy institut tuberkuleza Ministerstva zdravookhraneniya RSFSR.